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(54) COMMUNICATION EQUIPMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To minimize deterioration of transmission efficiency and also to effectively sending transmission confirmation by storing the transmission priority of the 1st and 2nd type information and then deciding and sending the transmission confirmation and a frame format consisting of the 1st or 2nd type information based on the stored priority.

SOLUTION: A protocol processing part 70 includes a sending confirmation transmission interval management part 70a, a sending confirmation transmission interval measurement part 70b and a constant interval progress notification part 70c in addition to the functions of protocol processing parts 31 and 32. A frame decision part 80 decides one of three types of frame formats which are previously set based on the contents (the data, voice information and image information to be sent, the presence or absence of occurrence of the sending confirmation, and the quantity of those data, voice information and image information) notified from the parts 70, 31 and 32 and also on the priority that is stored in a sending priority management part 80a. Then the decided frame format is notified to a multiplexing part 50.
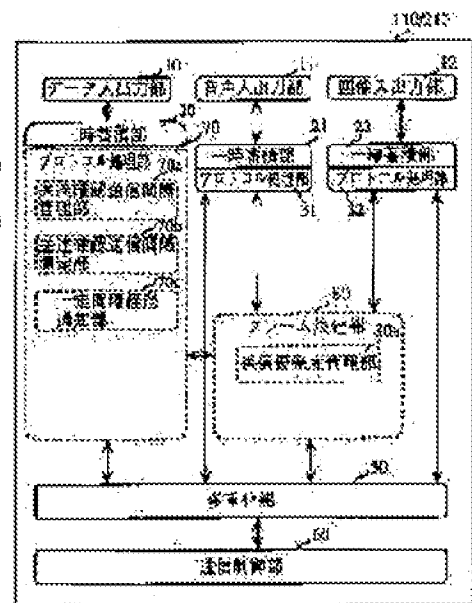
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MACHINE TRANSLATION

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the technique of returning efficiently the confirmation of receipt to the data especially received about the communication device transmitted and received on real time in the transmission band which multiplexed the information on classification which is [data / an image, voice,] different, and was restricted.
[0002]
[A related technique] In recent years, the multimedia communication which transmits and receives voice, an image, and data is capturing the spotlight, and the various devices and software for it are developed. A video conference system, a TV phone, etc. are the typical example. These multimedia communication terminal must be transmitted and received in the transmission band to which voice, an image, and data were restricted (when using PHS, it is 1 circuit 32kbps). Here, the digital information (speech information, image information) showing voice or an image means the digital information of a different classification, for example, data are a program code etc.
[0003] as an effective means to transmit and receive the multimedia information which contains voice, an image, data, etc. in the limited transmission band -- ******** -- there is the approach of multiplexing the information on classification on one frame, and communicating. For example, it is one of the approaches of multiplexing, transmitting and receiving the information on classification that recommendation ITU-T DRAFT RECOMMENDATION H.223/ANNEX A (December 6, 1996) of ITU-T about the real-time communication link of voice, an image, and data also differs, on one frame.
[0004] Drawing 17 is the external view showing an example at the time of realizing the system which multiplexes, transmits and receives voice, an image, and data on one frame according to the above-mentioned recommendation. This system consists of two sets of the complex terminals 100 and 200 using a PHS telephone. These complex terminals 100 and 200 are equipped with the cameras 101 and 201 for capturing an image, antennas 102 and 202, the display screens 103 and 203, loudspeakers 104 and 204, microphones 105 and 205, and a keypad 106, respectively.
[0005] Voice and an image are transmitted in both directions, and signs that data are transmitted to a uni directional (from a complex terminal 100 to a complex terminal 200) are shown by this Fig. Moreover, the frame structure shall be based on the 1st edition (PIAFS) of data communication specification PHS INTERNET ACCESS FORUM STANDARD which a PHS Internet access forum specifies. That is, voice, an image, data, etc. are multiplexed on a 640-bit fixed-length frame, and are mapped, transmitted and received.
[0006] Drawing 18 is the functional block diagram showing the internal configuration of the above-mentioned complex terminals 100 and 200. The data I/O section 10 consists of

a keypad 106, a data arithmetic circuit, etc., and generates the data to transmit, or performs data processing using the received data. The voice-input/output section 11 consists of loudspeakers 104 and 204, microphones 105 and 205, a voice codec, etc., and generates the speech information which transmits, or carries out voice playback of the speech information which received.

[0007] The image I/O section 12 consists of cameras 101 and 201, display screens 103 and 203, an image codec, etc., and generates the image information which transmits, or carries out image reconstruction of the image information which received. The are recording sections 20-22 are buffers which memorize temporarily the data concerning transmission or reception, speech information, and image information, respectively temporarily.

[0008] The protocol processing sections 30-32 perform the communications processing (processing which is equivalent to the upper layer from the physical layer) of a proper to data, speech information, and image information according to the protocol specified by the above-mentioned recommendation and the telecommunications standard, respectively. When the data / speech information / image information which should transmit specifically occur as transmitting processing, that and its amount are notified to the frame decision section 40, or the transmit data / speech information / image information put on the are recording sections 20-22 temporarily are read, and after adding CRC and the sequence number for error detection correction to it, the multiplexing section 50 is passed. Moreover, after performing error detection correction based on CRC to which the received data / speech information / image information separated in the multiplexing section 50 were added by reception and there as reception, it stores in the are recording section 20 temporarily, or a resending demand is given to a communications partner.

[0009] The frame decision section 40 opts for the format which uses for the next transmission the existence of generating of the data / speech information / image information which should transmit, and the advice about the amount out of the reception from each protocol processing sections 30-32, and the frame format of two or more classes defined beforehand, and notifies the result to the multiplexing section 50. Drawing 2 (a) and drawing 2 (b) are drawings showing the frame format of the class of these plurality.

[0010] Drawing 2 (a) shows the format which can transmit simultaneously the information on the classification of all voice, images, and data, and drawing 2 (b) shows the format which can transmit only voice and an image simultaneously. The format identifier which specifies the class of the frame format is contained in a header. The format a shown in drawing 2 (a) when the data which should be transmitted remained is used for the frame decision section 40, and when the data which should be transmitted do not remain, the format b shown in drawing 2 (b) is used for it. In addition, in above-mentioned H.223/ANNEX A, although it is necessary to make it unify between a complex terminal 100 and a complex terminal 200 about these formats, determining dynamically is also possible by carrying out a negotiation according to the procedure of ITU-T DRAFT RECOMMENDATION H.245 publication.

[0011] The multiplexing section 50 generates a frame by multiplexing each information processed in each protocol processing sections 30-32 according to the frame format for which the frame decision section 40 opted, and after it sends to the communications control section 60 or it divides a frame into speech information, image information, and

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data by interpreting the header of the frame received by the communications control section 60, it distributes it to each protocol processing sections 30-32.

[0012] The communications control section 60 consists of modulator and demodulator, an antenna 102, and 202 grades, after modulating the frame of the 640 bit length generated in the multiplexing section 50 according to the communication procedure of PHS, wireless transmission is carried out, or after it receives the frame by which wireless transmission has been carried out and recovers from a communications partner, it is passed to the multiplexing section 50. The system transmitted and received in the transmission band to which the multimedia information which contains voice, an image, and data as mentioned above was restricted is built.

[0013]

[Problem(s) to be Solved by the Invention] However, there are the following unsolved technical problems in the above-mentioned system. That is, when the above-mentioned data are data of the classification which does not permit a transmission error (i.e., when advice (confirmation of receipt) of (negative-acknowledge;NAK) must be returned to a transmitting side for whether it is that the receiving side received the data correctly (positive acknowledge; ACK)), the return method of the efficient confirmation of receipt in consideration of the effect (lowering of a substantial transmission speed) of the transmission efficiency on voice, an image, and each data is not yet proposed.

[0014] Here, if it limits to the system which transmits and receives only the information on single classification instead of multimedia information, there is the conventional technique of avoiding decline in the transmission efficiency of data, by lowering the transmitting frequency of the confirmation of receipt. For example, when a transmitting side attaches a sequence number to data, bundles up continuously the data frame of two or more sequence numbers, and transmits and a receiving side returns the confirmation of receipt to the data of a mass of to a transmitting side, a transmitting side is the method of getting to know what data were mistaken and was transmitted to the receiving side there being nothing.

[0015] In the High level Data Link Control (HDLC) procedure which is Japanese Industrial Standards, a transmitting side carries out continuous transmission of an outstanding number of the data frames defined beforehand, and, specifically, a receiving side returns the confirmation of receipt of data to a transmitting side by the RR command and RR response of supervisory format (however, in an HDLC procedure, the timing which transmits RR is not specified, except when there is a demand from a transmitting side.).

[0016] In the system by which only the information on single classification is transmitted and received, these conventional technique is a technique of taking only the transmission efficiency of the information into consideration, and is not a technique which raises the transmission efficiency as the whole system in the system by which information with two or more another sorts, such as voice, an image, and data, is transmitted and received, taking the property of each information into consideration. That is, although the transmission efficiency of data becomes good in our having decided to give priority to the confirmation of receipt over speech information or image information, and to only return it frequently since the transmitting side of data can obtain the confirmation of receipt finely, the transmission speed of speech information and image information falls, and conversation with the real time nature accompanied by an image becomes difficult.

Reversely, by having enlarged transmitting spacing of the confirmation of receipt, although the transmission speed of speech information or image information is maintained reversely, the transmission efficiency of data falls and it only causes the trouble of a required program code not being transmitted.

[0017] Then, this invention is a communication device which is made in view of the above-mentioned point, and transmits and receives the information on two or more classification like an image, voice, data, etc., and it sets it as the 1st object to offer the communication device which can transmit the confirmation of receipt efficiently, taking into consideration the properties (real time nature etc.) of each information while it suppresses decline in the transmission efficiency of these information to the minimum.

[0018] Moreover, the 2nd object of this invention aims at offering the flexible communication device which can change the frequency where the confirmation of receipt is transmitted according to change of a communication link situation.

[0019]

[Means for Solving the Problem] The 1st classification information for which this invention needs the confirmation of receipt in order to attain the above-mentioned object, Said 1st classification information is a communication device which multiplexes multimedia information including the 2nd classification information on a different class, and is transmitted and received per frame. A fixed period progress detection means to detect that a fixed period has passed after transmitting the confirmation of receipt finally, After said detection is made, it has a confirmation-of-receipt transmitting means to transmit the frame containing the confirmation of receipt to the already received 1st classification information. The priority storage section which memorizes the priority concerning [said confirmation-of-receipt transmitting means] the transmission about the confirmation of receipt, the 1st classification information, and the 2nd classification information, The frame decision section which opts for the frame format which consists of at least one of the confirmation of receipt which should transmit according to the priority memorized by said priority storage section, the 1st classification information, and the 2nd classification information, It is characterized by including the transmitting section which transmits a frame according to the frame format for which it opted.

[0020] Even if it is the case where the confirmation of receipt needs to be transmitted continuously, these confirmation of receipt is transmitted at least by this in consideration of the priority about other information that spacing is kept and only a fixed period should be transmitted. Therefore, while suppressing decline in the transmission efficiency of these information to the minimum, the communication device which transmits the confirmation of receipt efficiently is realized, taking into consideration the property of each information reflected in priority.

[0021] Moreover, the side which receives data in the communication system which transmits and receives an image, voice, data, etc. on real time in the transmission band multiplexed and restricted with the function to manage the confirmation-of-receipt [degree] transmit timing used as criteria until it carries out transfer appearance since the confirmation of receipt of data is sent out last time It can have the function to manage the transmitting priority about the various exception information containing the confirmation of receipt, and can also consider as the configuration to which the two above-mentioned parameters (confirmation-of-receipt transmit timing and transmitting priority) are changed with the transmission quality, the amount of information which should be

transmitted.

[0022] The flexible communication device with which the frequency where the confirmation of receipt is transmitted by this according to change of a communication link situation is changed is realized.

[0023]

[Embodiment of the Invention] Hereafter, the gestalt of operation of the communication device concerning this invention is explained using a drawing. In addition, this communication device is a complex terminal using a PHS telephone, and, specifically, is common on the related technique mentioned above in the point which constitutes the PHS telephone complex-terminal system shown in drawing 17 . And this system multiplexes, transmits and receives the data which do not permit voice, an image, and a transmission error according to above-mentioned ITU-T DRAFT RECOMMENDATION H.223/ANNEX A on one frame, and that frame is made into the 640-bit fixed length according to the 1st edition (PIAFS) of data communication specification PHS INTERNET ACCESS FORUM STANDARD which a PHS Internet access forum specifies.

(Gestalt 1 of operation) The complex terminals 110 and 210 concerning the gestalt 1 of operation are explained first.

[0024] The complex terminals 110 and 210 concerning the gestalt 1 of operation are characterized by having both the function to manage transmitting spacing of the confirmation of receipt, and the function to manage the priority at the time of transmitting the information according to various kinds. Drawing 1 is the functional block diagram showing the configuration of the PHS telephone complex terminals 110 and 210 concerning the operation gestalt 1. The component which is common on the related technique which this Fig. corresponds to drawing 18 in the related technique mentioned above, and was mentioned above is the block surrounded as the continuous line, and attaches the same sign. A different component from the related technique mentioned above is the block surrounded by the dotted line.

[0025] Complex terminals 110 and 210 consist of the protocol processing sections 31 and 32, the frame decision sections 80, the multiplexing sections 50, and the communications control sections 60 for the data I/O section 10, the voice-input/output section 11, the image I/O section 12, the protocol processing section 70 of the for the are recording sections 20-22 and for data temporarily, the object for voice, and images. In addition to the function with which the protocol processing section 30 in the related technique mentioned above is equipped, the protocol processing section 70 is equipped with confirmation-of-receipt transmitting spacing Management Department 70a, confirmation-of-receipt transmitting spacing test-section 70b, and advice section of fixed spacing progress 70c. Similarly, in addition to the function with which the frame decision section 40 in the related technique mentioned above is equipped, the frame decision section 80 is equipped with transmitting priority Management Department 80a. Hereafter, it explains focusing on a point of difference with the configuration in the related technique mentioned above.

[0026] Confirmation-of-receipt transmitting spacing Management Department 70a memorizes criteria spacing after consisting of RAM etc. and transmitting the confirmation of receipt to the received data last time until it transmits next time. Here, criteria spacing consists of two parameters which specify the minimum transmitting

spacing of the confirmation of receipt, i.e., criteria classification (distinction of whether it is based on the number of the frame in which data were contained, or to be based on elapsed time after transmitting last time until it transmits next time) and a basis (the number or its elapsed time). With the gestalt of this operation, confirmation-of-receipt transmitting spacing Management Department 70a remembers a basis "5" to be criteria classification "a frame" as initial value. This means what "the following confirmation of receipt is not transmitted for until it receives at least five frames in which data were contained."

[0027] Confirmation-of-receipt transmitting spacing test-section 70b consists of a counter, a timer, etc., and measures spacing after transmitting the confirmation of receipt last time. When the confirmation of receipt created in the protocol processing section 70 is specifically transmitted, an internal counter and an internal timer are reset (when reading appearance is carried out to the multiplexing section 50), and renewal of record of the elapsed time from the reset is carried out per ms at the same time it carries out renewal of record of the number of the frame in which it is the frame received after that and data were contained at a counter.

[0028] Advice section of fixed spacing progress 70c is monitoring continuously whether it having been in agreement or having exceeded with criteria spacing the counter of confirmation-of-receipt transmitting spacing test-section 70b and the value of a timer were remembered to be by confirmation-of-receipt transmitting spacing Management Department 70a, and if it detects that criteria spacing which confirmation-of-receipt transmitting spacing Management Department 70a memorizes passed, it will notify the purport which the confirmation of receipt which should transmit generated to the frame decision section 80. For example, when the above-mentioned criteria classification "a frame" and a basis "5" are memorized by confirmation-of-receipt transmitting spacing Management Department 70a, advice section of fixed spacing progress 70c notifies the purport which the confirmation of receipt which should transmit generated to the frame decision section 80, when the counted value of confirmation-of-receipt transmitting spacing test-section 70b amounts to "5."

[0029] Transmitting priority Management Department 80a consists of RAM etc., and memorizes the priority of the transmission about four kinds of information, i.e., data, speech information, image information, and the confirmation of receipt. Specifically, order called speech information, data, the confirmation of receipt, and image information is memorized as initial value from the one where a priority is higher. The frame decision section 80 determines one out of three kinds of frame formats defined beforehand according to the content (the existence of generating of the data / speech information / image information / confirmation of receipt which should transmit, and amount of its data / speech information / image information) notified from the protocol processing sections 70, 30, and 31, and the priority memorized by transmitting priority Management Department 80a, and notifies the result to the multiplexing section 50. As long as it remains with either the data / speech information / image information / confirmation of receipt not transmitted which should transmit, the frame decision section 80 is repeated whenever the decision and advice are transmitted to one frame. Transmission of a frame is repeated until non-transmitted data / speech information / image information / confirmation of receipt are lost by this.

[0030] Drawing 2 (a) - (c) is drawing showing these three kinds of frame formats. The

format c (format which transmits simultaneously voice, an image, and three kinds of information on the confirmation of receipt) which was used with the related technique mentioned above and which is shown in drawing 2 (c) other than two kinds of formats (drawing 2 (a) and drawing 2 (b)) is newly added.

[0031] Drawing 3 shows the decision flow of the frame format by the frame decision section 80. When having received advice of the purport which the data which should be transmitted from the protocol processing section 70 have generated, Format a is used for the frame decision section 80 until it finishes transmitting all the data (step S300). On the other hand, when there are no data which should be transmitted, when having received advice of the purport which the confirmation of receipt which should transmit from advice section of fixed spacing progress 70c has generated, Format c is adopted (steps S301 and S303), and Format b is adopted when having not received the advice (steps S301 and S304).

[0032] In addition, not judging the existence of the speech information which should transmit in this Fig. The priority of image information of not judging the existence of the image information which is because the same quantity of speech information is contained in the three above-mentioned kinds of any format, and should transmit that the real time nature of voice communication should be secured is the lowest, And it is because [even if it is the case where neither the data and the confirmation of receipt which should transmit, nor image information is generated] the format b which contains image information as a default is adopted. Moreover, the existence (step S300) of data is previously judged rather than the existence (step S301) of the confirmation of receipt because the priority memorized by transmitting priority Management Department 80a was followed.

[0033] Next, actuation in case the complex terminals 110 and 210 constituted as mentioned above communicate is explained. In addition, like the case of the related technique mentioned above, a complex terminal 110 shall transmit data, speech information, and image information to a complex terminal 210, and, on the other hand, a complex terminal 210 shall transmit the confirmation of receipt, speech information, and image information to a complex terminal 110.

[0034] Drawing 4 is the sequence diagram showing an exchange of the frame centering on actuation with the complex terminal 210 which is the side which receives data. According to this Fig., it explains centering on the place which relates to transmission of the confirmation of receipt about actuation of a complex terminal 210. Drawing 4 is the sequence diagram showing an exchange of the frame centering on actuation with the complex terminal 210 which is the side which receives data. According to this Fig., it explains centering on the place which relates to transmission of the confirmation of receipt about actuation of a complex terminal 210.

[0035] In addition, in this Fig., ten frames 400 on a par with a left column show the receiving frame sent from a complex terminal 110 to time series, and, on the other hand, the nine-piece frame 402 on a par with a right column shows the transmitting frame which this complex terminal 210 transmitted to time series. Moreover, the time-axis 401 shown in the center shows the timing to which this complex terminal 210 transmits and receives a frame.

[0036] Moreover, the notation in each frame (H, A, D (n), V, D (n*)) corresponds to the classification of each information shown in drawing 2 (a) - (c). In addition, n in Notation

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D (n) is a sequence number which the protocol processing section 70 adds, and is for managing per frame that mistake and data are transmitted that there is nothing. Moreover, Notation D (n*) is the confirmation of receipt to the data to the already received data D (n-1), and shows the purport which is ready for receiving the following data D (n) simultaneously.

[0037] Suppose that the confirmation of receipt D (1*) to the data D (0) which the complex terminal 210 received was now transmitted in time of day t1. To this transmission and coincidence, confirmation-of-receipt transmitting spacing test-section 70b starts measurement of spacing until it next transmits the confirmation of receipt. Confirmation-of-receipt transmitting spacing test-section 70b resets an internal counter and an internal timer, and specifically, it carries out renewal of record of the elapsed time from the reset per ms at the same time it carries out renewal of record of the number of the frame in which it is the frame received after that and data were contained at a counter. This measurement is continued until reading appearance of the confirmation of receipt specifically created in the protocol processing section 70 until the confirmation of receipt was transmitted next is carried out to the multiplexing section 50.

[0038] In time of day t2-t3, since the information which should be transmitted is only speech information and image information, a complex terminal 210 transmits four frames by the format b shown in drawing 2 (b) to a complex terminal 110. In time of day t3, since the counted value of confirmation-of-receipt transmitting spacing test-section 70b is set to "5", it notifies that detected that the basis "5" of advice section of fixed spacing progress 70c memorized by the counted value "5" and confirmation-of-receipt transmitting spacing Management Department 70a corresponded, and the confirmation of receipt which should transmit occurred to the frame decision section 80. And the protocol processing section 70 creates the confirmation of receipt D (6*) which is frame data for it, adds a CRC bit to the confirmation of receipt D (6*) further, and makes transmitting preparations of the confirmation of receipt.

[0039] The advice from advice section of fixed spacing progress 70c the carrier beam frame decision section 80 The speech information which should transmit although the data (it is un-transmitting) which should be transmitted are not generated in time of day t3, the format c shown in drawing 2 (c) according to the decision flow shown in above-mentioned drawing 3 by that image information and the confirmation of receipt have occurred (be) and referring to the priority memorized by transmitting priority Management Department 80a should be adopted -- ** -- it determines.

[0040] Consequently, a complex terminal 210 transmits the frame containing the confirmation of receipt D (6*) which shows the purport that Data D (1) - D (5) have been received correctly to a complex terminal 110 immediately after time of day t3. If this confirmation of receipt D (6*) is transmitted, while confirmation-of-receipt transmitting spacing test-section 70b will reset an internal counter and an internal timer and starting measurement of transmitting spacing again, advice section of fixed spacing progress 70c supervises whether with the progress criteria the value of that counter and a timer was remembered to be by confirmation-of-receipt transmitting spacing Management Department 70a, it was in agreement or exceeded. Thus, whenever a complex terminal 210 receives the frame containing five data, it repeats actuation of answering a communications partner in the one confirmation of receipt.

[0041] According to this operation gestalt, as mentioned above, sequence attachment and

error detection of data transmission, Means 70a-70c to manage criteria spacing for transmitting the confirmation of receipt of data intermittently in the protocol processing section 70 which resends data are established. By having prepared means 80a which manages the priority of (the data / speech information / image information / confirmation of receipt) for every informational classification which transmits in the frame decision section 80 which opts for a format of the multiplexing frame to transmit A letter can be answered in the confirmation of receipt to the received data, without lowering the transmission efficiency of speech information or image information (information other than data). That is, it not only decreases the transmitting frequency of the confirmation of receipt, but the transmission control of the confirmation of receipt in consideration of the priority for every informational classification which transmits is performed.

[0042] In addition, in such a case, this invention is not limited although premised on the data which should be transmitted in a complex terminal 210 not being generated with the gestalt of the above-mentioned implementation. For example, in the time of day t3 of the gestalt of the above-mentioned implementation, when the data which should be transmitted are generated, Format a will be adopted until all the data are transmitted, and there is no guarantee to which the confirmation of receipt D (6*) is not necessarily transmitted immediately after time of day t3. Therefore, what is necessary is just to create the protocol processing section 70, updating the confirmation of receipt D corresponding to the counted value n (n*), since it counts up without resetting the content of confirmation-of-receipt transmitting spacing test-section 70b when the created confirmation of receipt D (6*) is not transmitted. Even if it is the case where the confirmation of receipt is not transmitted immediately after reaching criteria spacing, the confirmation of receipt to the data received by just before will always be prepared by this, and it will be transmitted.

[0043] Moreover, as long as it is the case where the data transmitted to a complex terminal 110 from a complex terminal 210 are generated frequently, the rule of always making transmit data and the confirmation of receipt into a pair, and transmitting by giving the confirmation of receipt to every one frame (data frame) may be established so that it may be specified for an HDLC procedure. For example, the format which included the confirmation of receipt in the data of Format a when the data which should be transmitted were generated is adopted, and when the data which should be transmitted are not generated, it can also combine so that the procedure in this operation gestalt may be taken. By this, the send efficiency of data and the confirmation of receipt improves.

[0044] Furthermore, when a transmission error occurs to the data which transmit and receive, an efficient data-transmission method can establish, maintaining a data quality by performing the resending processing based on the existing resending procedure (for example, GOBACKN which is the procedure "which resends all after the frame which the transmission error generated" and SelectiveRepeat which is the procedure "which resends only the frame which the transmission error generated"), when a transmission error occurs.

[0045] moreover -- although transmitting priority Management Department 80a was made to provide in the frame decision section 80 in this operation gestalt -- the protocol processing sections 70 and 30 -- and in 31, it is alike, respectively, and it may be made to provide, and the frame decision section 80 may access these and may determine a transmitting frame.

(Gestalt 2 of operation) Next, the complex terminals 120 and 220 concerning the gestalt 2 of operation are explained.

[0046] The complex terminals 120 and 220 concerning the gestalt 2 of operation are characterized by changing the priority which transmits the confirmation of receipt and making it high, when the timing which transmits the confirmation of receipt is delayed for a schedule. Drawing 5 is the functional block diagram showing the configuration of the PHS telephone complex terminals 120 and 220 concerning the operation gestalt 2.

[0047] The points which are different from the operation gestalt 1 are that 70d of advice sections of confirmation-of-receipt transmitting delay is added to the protocol processing section 70, and that transmitting priority modification section 80b is added to the frame decision section 80. The explanation about the components 10-12 which are common in the operation gestalt 1, 20-22, 31, 32, 70, 70a-70c, and 80, 80a, 50 and 60 is omitted.

[0048] 70d of advice sections of confirmation-of-receipt transmitting delay has the function which notifies the degree (the amount of delay) of delay from said criteria spacing to the frame decision section 80, when the confirmation of receipt is not transmitted immediately after only criteria spacing which confirmation-of-receipt transmitting spacing Management Department 70a memorizes passes, but it was late and is transmitted. A difference with the basis memorized by the value and confirmation-of-receipt transmitting spacing Management Department 70a whenever it specifically supervised the value corresponding to the criteria classification memorized by confirmation-of-receipt transmitting spacing Management Department 70a among the counter of confirmation-of-receipt transmitting spacing test-section 70b and the value of a timer and the value was updated is computed, and it notifies to transmitting priority modification section 80b by making it into the amount of delay.

[0049] With this operation gestalt, since criteria classification "a frame" and a basis "5" are memorized by confirmation-of-receipt transmitting spacing Management Department 70a as criteria spacing, for example, when the counted value of confirmation-of-receipt transmitting spacing test-section 70b is set to "6", the difference "1" is notified, and when counted value is set to "8", the difference "3" is notified. Transmitting priority modification section 80b changes the priority memorized by transmitting priority Management Department 80a according to the amount of delay notified from 70d of advice sections of confirmation-of-receipt transmitting delay. Transmitting priority modification section 80b reads the basis beforehand memorized by confirmation-of-receipt transmitting spacing Management Department 70a, and specifically, it changes it so that only one may become high about the priority about data and the confirmation of receipt, whenever the amount of delay notified from 70d of advice sections of confirmation-of-receipt transmitting delay exceeds the one half of the basis. With this operation gestalt, the priority memorized by transmitting priority Management Department 80a whenever the amount of delay notified from 70d of advice sections of confirmation-of-receipt transmitting delay becomes 3, 5, 8, and ..., since the one half of the basis memorized by confirmation-of-receipt transmitting spacing Management Department 70a is "2.5" is read, and ranking is updated so that only one priority may become high about two kinds of information, data and the confirmation of receipt.

[0050] In addition, when the priority of data or the confirmation of receipt turns into highest ranking as a result of modification, updating beyond it is not performed. Moreover, when the confirmation of receipt is transmitted, early priority is returned to

transmitting priority Management Department 80a that the modification till then should be reset. Next, actuation in case the complex terminals 120 and 220 constituted as mentioned above communicate is explained.

[0051] Drawing 6 is the sequence diagram showing an exchange of the frame centering on actuation with the complex terminal 220 which is the side which receives data. This Fig. is drawing corresponding to drawing 4 in the operation gestalt 1. A complex terminal 120 receives a complex terminal 220 like the case of the operation gestalt 1. In addition, data, Speech information and image information are transmitted and, on the other hand, a complex terminal 220 receives a complex terminal 120. The confirmation of receipt, Make the frame format which shall transmit speech information and image information and the frame decision section 80 adopts into three kinds shown in drawing 2 (a) - drawing 2 (c), and let criteria spacing memorized by confirmation-of-receipt transmitting spacing Management Department 70a be criteria classification "a frame" and criteria spacing "5." However, it is different from the operation gestalt 1, and as shown in the line of the time of day t1-t5 of drawing 7, let early priority memorized by transmitting priority Management Department 80a be speech information, image information, data, and the confirmation of receipt from the one where a priority is higher.

[0052] Drawing 7 is drawing showing the content of storage of transmitting priority Management Department 80a in each time of day shown in drawing 6 (priority), and is drawing showing signs that priority is changed by transmitting priority modification section 80b. Suppose that the confirmation of receipt D (1*) to the data D (0) which the complex terminal 220 received was now transmitted like the case of the operation gestalt 1 in time of day t1.

[0053] Since transmitting priority modification section 80b resets the content (priority) of transmitting priority Management Department 80a immediately after this, priority serves as order shown in the line of the time of day t1-t5 of drawing 7. Consequently, the frame decision section 80 opts for a format of a transmitting frame according to the decision flow shown in drawing 8. Drawing 8 is drawing showing the decision flow of the frame format in the priority shown in the line of the time of day t1-t5 of drawing 7.

[0054] It judges whether the frame decision section 80 has some which should transmit at the event in order of image information, data, and the confirmation of receipt, and in a certain case, when Formats b, a, and c are adopted and there are no all, Format b is adopted as a default, respectively. In addition, in this decision flow, the existence of the speech information which should transmit is not judged because the same quantity of speech information is contained in any format, and it has judged in order of image information, data, and the confirmation of receipt because the priority memorized by transmitting priority modification section 80b was followed.

[0055] Thus, in time of day t2-t3, since only the speech information and image information which should transmit to this complex terminal 220 have occurred, the frame decision section 80 determines that it will adopt Format b (steps S310 and S313), and a complex terminal 220 transmits the frame of four formats b. In time of day t3, like the case of the operation gestalt 1, advice section of fixed spacing progress 70c prepares the protocol processing section 70 for creating the confirmation of receipt D (6*), and transmitting while notifying that confirmation-of-receipt transmitting criteria spacing passed in the frame decision section 80 (namely, confirmation-of-receipt Request to Send). It means that the confirmation of receipt which should transmit in this time of day

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t3 by this had occurred.

[0056] However, the frame decision section 80 determines that it will adopt Format b, in order to follow the decision flow shown in drawing 8 . Therefore, the condition that only speech information and image information are transmitted and the confirmation of receipt is not transmitted like till then (time of day t2-t3) will continue (time of day t3-t5). in time of day t4, the protocol processing section 70 received the frame which contains the new data D (6) while the confirmation of receipt D (6*) which was being prepared has not been transmitted -- since things are got to know, the confirmation of receipt D (6*) which became old is canceled, and the confirmation of receipt D (7*) is newly created and prepared. Furthermore, 70d of advice sections of confirmation-of-receipt transmitting delay is notified to transmitting priority modification section 80b by making into the amount of delay a difference "1" with the basis "5" memorized by the counted value "6" of confirmation-of-receipt transmitting spacing test-section 70b, and confirmation-of-receipt transmitting spacing Management Department 70a. The threshold "2.5" to which carrier beam transmitting priority modification section 80b has remembered the advice beforehand to be the amount of delay "1" is compared. Consequently, since the amount of delay has not reached a threshold, transmitting priority modification section 80b is maintained as it is, without changing the content of transmitting priority Management Department 80a.

[0057] However, in time of day t5, since 70d of advice sections of confirmation-of-receipt transmitting delay notifies the amount of delay "3" to transmitting priority modification section 80b, the amount of delay "3" judges that advice is over a threshold "2.5", and carrier beam transmitting priority modification section 80b updates the content of storage of transmitting priority Management Department 80a. That is, it changes into the new priority (priority shown at the time of day t5-t6 of drawing 7) which advanced only one ranking about data and the confirmation of receipt from the priority till then.

[0058] This new priority is the same as the priority in the operation gestalt 1, consequently the frame decision section 80 specifies a format of a transmitting frame according to the decision flow shown in drawing 3 . Therefore, in time of day t5, although what should transmit is speech information, image information, and the confirmation of receipt, the frame decision section 80 determines the following transmitting frame as Format c according to the decision flow of drawing 3 .

[0059] Consequently, in time of day t6, the frame by the format c containing the confirmation of receipt D (9*) which the protocol processing section 70 was preparing immediately before is transmitted to a complex terminal 120. As mentioned above, according to this operation gestalt, the communication device and communication system which established the decision rule about the transmit timing of the following confirmation of receipt are realized.

[0060] - Transmit the confirmation of receipt to timing with little amount of information other than data after criteria spacing progress. However, the transmitting priority of the confirmation of receipt is set up low.

- There is always many amount of information other than data after criteria spacing progress, when the timing which transmits the confirmation of receipt is not found, by the delay degree from criteria spacing, a transmitting priority can be changed (raising) and the confirmation of receipt can be transmitted.

[0061] That is, according to the operation gestalt 2, 70d of advice sections of

confirmation-of-receipt transmitting delay is prepared in the protocol processing section 70. By preparing transmitting priority modification section 80b in the frame decision section 80, and determining the timing which changes a transmitting priority and transmits the confirmation of receipt by the confirmation-of-receipt transmitting delay degree from criteria spacing which transmits the confirmation of receipt The confirmation of receipt can be effectively transmitted about the information on classification other than data using timing with few amounts which should be transmitted. (Gestalt 3 of operation) Next, the complex terminals 130 and 230 concerning the gestalt 3 of operation are explained.

[0062] The complex terminals 130 and 230 concerning the gestalt 3 of operation are characterized by changing the priority which transmits the confirmation of receipt and making it low, when the need of resending an image occurs. Drawing 9 is the functional block diagram showing the configuration of the PHS telephone complex terminals 130 and 230 concerning the operation gestalt 3. The points which are different from the operation gestalt 1 are having the protocol processing section 71 which replaces the complex terminals 130 and 230 of this operation gestalt with the protocol processing section 32 of the operation gestalt 1, and has image information resending Management Department 71a, and that transmitting priority modification section 80b is added to the frame decision section 80. The explanation about the components 10-12 which are common in the operation gestalt 1, 20-22, 31, 70, 70a-70c, and 80, 80a, 50 and 60 is omitted.

[0063] Image information resending Management Department 71a judges the existence of the image information resent to a complex terminal 130, or when there is image information to resend, it determines and memorizes the resending frame length, or it has the function which notifies the purport which the image information further resent to the frame decision section 80 generated. Whether the demand of the purport which resends image information to the received frame is included judges, and when contained, specifically, the amount of information (resending frame length) specified with the demand is detected further.

[0064] Transmitting priority modification section 80b has the function to change the transmitting priority remembered that image information is transmitted preferentially by transmitting priority Management Department 80a until advice of the purport which the image information resent from image information resending Management Department 71a generated is transmitted to the image information at the time of a carrier beam. After the image information which makes low only one priority about data and the confirmation of receipt, and is resent is transmitted by rewriting the priority carrier beam transmitting priority modification section 80b was remembered to be by transmitting priority Management Department 80a in the advice, specifically, it returns to the priority before modification.

[0065] Next, actuation in case the complex terminals 130 and 230 constituted as mentioned above communicate is explained. Drawing 10 is the sequence diagram showing an exchange of the frame centering on actuation with the complex terminal 230 which is the side which receives data. This Fig. is drawing corresponding to drawing 4 in the operation gestalt 1.

[0066] In addition, the notation "V**" used in this Fig. means the image information to resend. Moreover, the early priority memorized by transmitting priority Management

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Department 80a of this operation gestalt is as being shown in the line of the time of day t1-t3 of drawing 11 , and is the same as the priority in the operation gestalt 1. In addition, criteria spacing memorized by an informational classification and confirmation-of-receipt transmitting spacing Management Department 70a which are transmitted and received presupposes that it is the same as the case of the operation gestalt 1.

[0067] Drawing 11 is drawing showing the content of storage of transmitting priority Management Department 80a in each time of day shown in drawing 10 (priority), and is drawing explaining signs that priority is changed by transmitting priority modification section 80b. In time of day t1-t3, this complex terminal 230 carries out the same actuation as the case of the operation gestalt 1.

[0068] Two events happen in time of day t3. One is the same as the case of the operation gestalt 1, and it is generating of the confirmation of receipt D (6*) which should transmit. That is, advice section of fixed spacing progress 70c notifies the purport that the counted value of confirmation-of-receipt transmitting spacing test-section 70b reached criteria spacing of confirmation-of-receipt transmitting spacing Management Department 70a to the frame decision section 80.

[0069] Another is generating of image information V** which should be resent. That is, suppose that the demand of the purport which resends the last image information for one frame into the frame received in this time of day t3 was included. Therefore, image information resending Management Department 71a notifies the purport which the image information which should be resent to the frame decision section 80 generated. The priority transmitting priority modification section 80b was first remembered to be by transmitting priority Management Department 80a in the carrier beam frame decision section 80 based on the advice from image information resending Management Department 71a in the above two advice is changed. Specifically, only one priority about data and the confirmation of receipt is made low. Consequently, priority becomes as it is shown in the line of the time of day t3-t4 of drawing 11 .

[0070] Then, the frame decision section 80 is referring to the priority memorized by an informational classification (the speech information, image information, and confirmation of receipt) and transmitting priority Management Department 80a which should transmit, and determines the following transmitting frame as Format b according to the decision flow shown in drawing 8 . In addition, it is because the priority (priority shown in the line of the time of day t3-t4 of drawing 11) of adopting the decision flow of drawing 8 acquired by the above-mentioned modification is the same as that of what was shown in the line of the time of day t1-t5 of drawing 7 in the operation gestalt 2.

[0071] Thus, the frame by the format b which contains playback image information V**, without including the confirmation of receipt D (6*) immediately after time of day t3 is transmitted. In time of day t4, since transmitting priority modification section 80b gets to know that image information V** which should be resent was transmitted, it is returned to the original priority (priority shown in the time of day t4 of drawing 11 - a line) by changing the content of storage of transmitting priority Management Department 80a.

[0072] And the frame decision section 80 determines the following transmitting frame as Format c according to the decision flow of drawing 3 from that what should transmit is speech information, image information, and the confirmation of receipt D (7*), and the priority memorized by transmitting priority Management Department 80a. Consequently, in time of day t5, the frame by the format c containing the confirmation of receipt D (7*)

which the protocol processing section 70 was preparing immediately before is transmitted to a complex terminal 120.

[0073] As mentioned above, according to this operation gestalt, the communication device and communication system which established the transmit timing decision rule of the following confirmation of receipt are realized.

- When there is strong image information of real time nature to resend, raise the priority of the image information resent rather than the confirmation of receipt of data.

That is, according to the operation gestalt 3, the confirmation of receipt of data can be efficiently transmitted by preparing image information resending Management Department 71a in the protocol processing section 71, and changing the confirmation of receipt of data, and the priority of image information to resend, when there is image information which prepares and resends transmitting priority modification section 80b to the frame decision section 80, without losing real time nature.

[0074] In addition, although image information resending Management Department 71a which notifies the purport which the image information to resend generated was made to provide in the protocol processing section 71 for image information, the protocol section for speech information or information voice and other than an image may be made to possess in the operation gestalt 3.

(Gestalt 4 of operation) Next, the complex terminals 140 and 240 concerning the gestalt 4 of operation are explained.

[0075] The complex terminals 140 and 240 concerning the gestalt 4 of operation are characterized by changing the priority which transmits the confirmation of receipt according to the transmission quality of data. Drawing 12 is the functional block diagram showing the configuration of the PHS telephone complex terminals 140 and 240 concerning the operation gestalt 4. The points which are different from the operation gestalt 1 are that advice section of the transmission quality 70e is added to the protocol processing section 70, and that transmitting priority modification section 80b is added to the frame decision section 80. The explanation about the components 10-12 which are common in the operation gestalt 1, 20-22, 31, 32, 70, 70a-70c, and 80, 80a, 50 and 60 is omitted.

[0076] Advice section of the transmission quality 70e computes the rate of reception of the error frame per unit time amount (transmission error incidence rate), and has the function notified to the frame decision section 80 by making the result into the transmission quality. It is referring to CRC specifically contained in the received frame, and it judges whether the transmission error has arisen on the received frame (is it an error frame or not?), and the ratio of the error frame occupied on all the frames received to unit time amount is repeated as a transmission error incidence rate, and is computed.

[0077] Transmitting priority modification section 80b has the function to change the priority memorized by transmitting priority Management Department 80a with the transmission quality notified from advice section of the transmission quality 70e. As compared with the threshold "0.001%" which the transmission error incidence rate notified from advice section of the transmission quality 70e specifically memorizes inside beforehand, in being larger than the threshold, it changes so that only one priority of data and the confirmation of receipt may become high rather than early priority, and in being small, it returns to early priority.

[0078] Next, actuation in case the complex terminals 140 and 240 constituted as

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mentioned above communicate is explained. Drawing 13 is the sequence diagram showing an exchange of the frame centering on actuation with the complex terminal 240 which is the side which receives data. This Fig. is drawing corresponding to drawing 4 in the operation gestalt 1.

[0079] In addition, the early priority memorized by transmitting priority Management Department 80a of this operation gestalt is as being shown in the line of the time of day t1-t3 of drawing 14 , and is the same as the priority in the operation gestalt 2. In addition, criteria spacing memorized by an informational classification and confirmation-of-receipt transmitting spacing Management Department 70a which are transmitted and received presupposes that it is the same as the case of the operation gestalt 1. Drawing 14 is drawing showing the content of storage of transmitting priority Management Department 80a in each time of day shown in drawing 13 (priority), and is drawing explaining signs that priority is changed by transmitting priority modification section 80b.

[0080] In time of day t1-t3, this complex terminal 230 carries out the same actuation as the case of the operation gestalt 1. Two events happen in time of day t3. One is the same as the case of the operation gestalt 1, and it is generating of the confirmation of receipt D (6*) which should transmit. That is, advice section of fixed spacing progress 70c notifies the purport that the counted value of confirmation-of-receipt transmitting spacing test-section 70b reached criteria spacing of confirmation-of-receipt transmitting spacing Management Department 70a to the frame decision section 80.

[0081] Another is deterioration of the transmission quality. That is, since the error had occurred in the received frame by this time of day t3, suppose that advice section of the transmission quality 70e notified the transmission error incidence rate "0.1%" to the frame decision section 80. The priority transmitting priority modification section 80b was first remembered to be by transmitting priority Management Department 80a in the carrier beam frame decision section 80 based on the advice from advice section of the transmission quality 70e in the above two advice is changed. Specifically, only one priority about data and the confirmation of receipt is made high. Consequently, priority becomes as it is shown in the line of the time of day t3-t4 of drawing 14 .

[0082] Then, the frame decision section 80 is referring to the priority memorized by an informational classification (the speech information, image information, and confirmation of receipt) and transmitting priority Management Department 80a which should transmit, and determines the following transmitting frame as Format c according to the decision flow shown in drawing 3 . In addition, it is because the priority (priority shown in the line of the time of day t3-t4 of drawing 14) of adopting the decision flow of drawing 3 acquired by the above-mentioned modification is the same as the priority in the operation gestalt 1.

[0083] Thus, in time of day t4, the frame by the format c containing the confirmation of receipt D (6*) is transmitted. Here, since transmitting priority modification section 80b will maintain early priority as it is, without changing the above priority supposing advice section of the transmission quality 70e notifies a transmission error incidence rate "0%" to the frame decision section 80, since the error has not occurred in the received frame by time of day t3, the frame decision section 80 determines the following transmitting frame as Format b. That is, the frame containing the confirmation of receipt is not transmitted only by the frame of Format c having been transmitted in time of day t4, because the two above-mentioned events lapped, and one of events arising.

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[0084] When the transmission quality of the received data deteriorates, the confirmation of receipt will be gradually returned to a transmitting side from a receiving side by this, and the confirmation of receipt is efficiently transmitted corresponding to change of the transmission quality. In addition, since advice section of the transmission quality 70e will notify a transmission error incidence rate "0%" to the frame decision section 80 supposing there is no error in the data D of the frame received in time of day t5 (6) and it has passed mostly rather than unit time amount since time of day t3 Transmitting priority modification section 80b is returned to early priority (priority shown in the time of day t4 of drawing 14 - a line) by changing the content of transmitting priority Management Department 80a.

[0085] As mentioned above, according to this operation gestalt, the communication device and communication system which established the transmit timing decision rule of the following confirmation of receipt are realized.
- Since priority is given to the informational transmission and reception which do not permit a transmission error when the transmission quality is bad, raise the priority of the confirmation of receipt.
- Since it is not necessary to transmit the confirmation of receipt frequently when the transmission quality is good, lower the priority of the confirmation of receipt.

[0086] That is, according to the operation gestalt 4, the effective confirmation-of-receipt transmit timing corresponding to the condition of the transmission quality can be determined by preparing advice section of the transmission quality 70e in the protocol processing section 70, preparing transmitting priority modification section 80b in the frame decision section 80, and changing the priority of the information transmitted with the transmission quality. In addition, the function to detect the condition of the transmission quality may be prepared in the communications control section 60.

[0087] Moreover, advice section of the transmission quality 70e may compute the ratio of the error frame number and the total receiving frame number which were received by the event as a transmission error incidence rate.

(Gestalt 5 of operation) Next, the complex terminals 150 and 250 concerning the gestalt 5 of operation are explained.

[0088] The complex terminals 150 and 250 concerning the gestalt 5 of operation are characterized by changing transmitting spacing of the confirmation of receipt based on the amount of delay of transmission. Drawing 15 is the functional block diagram showing the configuration of the PHS telephone complex terminals 150 and 250 concerning the operation gestalt 5. The point which is different from the operation gestalt 1 is that 70f of confirmation-of-receipt transmitting spacing modification sections and 70g of transit delay test sections are added to the protocol processing section 70. The explanation about the components 10-12 which are common in the operation gestalt 1, 20-22, 31, 32, 50, 60, 70, 70a-70c, and 80 and 80a is omitted.

[0089] 70g of transit delay test sections has the function which measures the transit delay of data. Here, a transit delay is time amount taken to receive the response to the data from a communications partner after transmitting data. Specifically, a PHS Internet access forum Engineering Department meeting measures the transit delay of data at fixed spacing according to the measuring method of the RTF value (transit delay) specified to the 1st edition (PIAFS) of PHS INTERNET ACCESS FORUM STANDARD which carried out specification (every other minute).

[0090] 70f of confirmation-of-receipt transmitting spacing modification sections has the function to change criteria spacing which confirmation-of-receipt transmitting spacing Management Department 70a memorizes according to the transit delay which 70g of transit delay test sections measured. Specifically, 70f of confirmation-of-receipt transmitting spacing modification sections will be changed into criteria spacing which makes criteria classification "elapsed time" and makes a basis "one half of the time amount of the transit delay", if advice is received from 70g of transit delay test sections about a transit delay.

[0091] Next, actuation in case the complex terminals 150 and 250 constituted as mentioned above communicate is explained. Drawing 16 (a) and drawing 16 (b) are the sequence diagrams showing an exchange of both the complex terminals 150 at the time of generating a transmission error in confirmation-of-receipt 412 the very thing transmitted to the complex terminal 150 from the complex terminal 250, and the frame between 250. Drawing 16 (a) shows the case after drawing 16 (b) was changed, when it is before early criteria spacing (criteria classification "a frame", basis "5") memorized by confirmation-of-receipt transmitting spacing Management Department 70a is changed.

[0092] In addition, the complex terminal 150 with which the left time-axis 410 transmitted data immediately before, and the right time-axis 411 correspond to actuation of the complex terminal 250 which received the data. Moreover, since only transmission and reception of the confirmation of receipt are made into the problem with this operation gestalt, the transmission and reception about the information on other classification (speech information, image information) are omitted by drawing 16 (a) and drawing 16 (b).

[0093] As shown in drawing 16 (a), before early criteria spacing memorized by confirmation-of-receipt transmitting spacing Management Department 70a is changed, by the time a complex terminal 250 receives the confirmation of receipt 414 in which a complex terminal 150 does not have an error in the advice 413 of the purport which the transmission error had generated in the confirmation of receipt 412 which transmitted immediately before since the confirmation of receipt 414 is resent after a carrier beam, the shortest will also be kept waiting only for a transit delay.

[0094] [as shown in drawing 16 (b), after the content of storage of confirmation-of-receipt transmitting spacing Management Department 70a was changed into criteria classification "elapsed time" and a basis "1/2 of a transit delay" on the other hand] Since a complex terminal 250 resends the confirmation of receipt (time of day t7) 415 before receiving the advice 413 of the purport which the transmission error had generated in the confirmation of receipt 412 which transmitted immediately before, a complex terminal 150 The confirmation of receipt 415 which does not have an error in an early phase (time of day t8) can be received without keeping only a transit delay waiting.

[0095] As mentioned above, according to the operation gestalt 5, when the data receiving side 250 transmits the confirmation of receipt effectively based on the measurement result of a transit delay, a data source 150 becomes possible [transmitting data efficiently]. In addition, although transmitting spacing of the confirmation of receipt was changed with the above-mentioned operation gestalt 5 based on the amount of transit delays measured by 70g of transit delay test sections, it can replace with the 70g of the above-mentioned transit delay test sections, and advice section of the transmission quality 70e in the operation gestalt 4 can also be prepared. That is, 70f of confirmation-of-receipt

transmitting spacing modification sections changes criteria spacing which confirmation-of-receipt transmitting spacing Management Department 70a memorizes according to the transmission quality which advice section of the transmission quality 70e calculated. The flexible communication device which can determine the effective confirmation-of-receipt transmit timing corresponding to the condition of the transmission quality of changing, by this is realized.

[0096] Moreover, with the above-mentioned operation gestalten 1-5, although an informational classification which does not permit a transmission error was "data", this invention is not limited to this and can perform transmission of effective speech information or image information by extending similarly the protocol processing sections 31 and 32 and the frame decision section 80 about "the speech information which does not permit a transmission error", and "the image information which does not permit a transmission error."

[0097] moreover -- the above-mentioned operation gestalten 1-5 -- complex terminals 110-150, and 210-250 -- "data", "speech information", and "image information" -- although the I/O section about all was provided, it is not necessary to provide these [all] that is, the input section -- good -- carrying out -- the output section -- it is good. Moreover, the classification of transmission information does not need to be "data", "speech information", and "image information." However, at least one of the transmission information multiplexed needs to be the information which does not permit a transmission error.

[0098] Furthermore, in the operation gestalten 1-5 of this invention, although complex terminals 110-150, and 210-250 were PHS telephones which communicate a line switching mold, this invention may be limited to neither line switching nor a PHS telephone, and may be the next-generation communication terminal of a packet-switching mold.

[0099]
[Effect of the Invention] The 1st classification information for which this invention needs the confirmation of receipt so that clearly from the above explanation, Said 1st classification information is a communication device which multiplexes multimedia information including the 2nd classification information on a different class, and is transmitted and received per frame. A fixed period progress detection means to detect that a fixed period has passed after transmitting the confirmation of receipt finally, After said detection is made, it has a confirmation-of-receipt transmitting means to transmit the frame containing the confirmation of receipt to the already received 1st classification information. The priority storage section which memorizes the priority concerning [said confirmation-of-receipt transmitting means] the transmission about the confirmation of receipt, the 1st classification information, and the 2nd classification information, The frame decision section which opts for the frame format which consists of at least one of the confirmation of receipt which should transmit according to the priority memorized by said priority storage section, the 1st classification information, and the 2nd classification information, It is characterized by including the transmitting section which transmits a frame according to the frame format for which it opted.

[0100] Even if it is the case where the confirmation of receipt needs to be transmitted continuously, these confirmation of receipt is transmitted at least by this in consideration of the priority about other information that spacing is kept and only a fixed period should

be transmitted. Therefore, while suppressing decline in the transmission efficiency of these information to the minimum, the communication device which transmits the confirmation of receipt efficiently is realized, taking into consideration the property of each information reflected in priority.

[0101] Here, said fixed period can also be made into a period until the total of the frame in which the 1st classification information was included among the frames received after transmitting the confirmation of receipt finally reaches constant value. Since the one confirmation of receipt is returned to a mass of frame by this, the frequency where the confirmation of receipt is transmitted decreases as compared with the case where the one confirmation of receipt is returned to one frame.

[0102] Moreover, said fixed period can also be made into a period after transmitting the confirmation of receipt finally until fixed time amount passes. Since this can restrict the count by which the confirmation of receipt is transmitted to per fixed time amount, it becomes easy to secure a substantial transmission speed of other information. Moreover, further, said communication device can be equipped with a means to measure time amount until the first frame containing said confirmation of receipt is transmitted, and a means to change the priority memorized by said priority storage section according to the measured time amount, after said detection is made, and it can also be supposed that said frame decision section is opted for said frame format according to the changed priority.

[0103] By usually making low the priority of the transmission about the confirmation of receipt at the time by this, and making a priority high with time amount progress, since it is guaranteed that the required confirmation of receipt is transmitted, priority at the time of other information that real time nature, such as voice, is required can usually be made high. Moreover, a means to detect whether advice of the purport which requires resending of said 2nd classification information is included in said multimedia information, and said advice is included in the frame which received said communication device further, It has a means to change the priority remembered to give priority to said 2nd classification information further, and to transmit when said advice was included and it is detected by said priority storage section. It can also be supposed that said frame decision section is opted for said frame format according to the changed priority.

[0104] Since it becomes possible to change priority so that priority may be given over transmission of the confirmation of receipt and image information may be resent when resending, since the error arose in image information, the real time nature in pictorial communication is secured by this, and degradation of image quality is suppressed. Moreover, said communication device can be equipped with a means to detect the incidence rate of the transmission error further produced in the received 1st classification information, and a means to change the priority memorized by said priority storage section according to the detected transmission error incidence rate, and it can also be supposed that said frame decision section is opted for said frame format according to the changed priority.

[0105] The flexible communication device which can change the frequency where the confirmation of receipt is transmitted by this according to change of a communication link situation is realized. And it becomes possible by raising the priority of transmission with the increment in a transmission error incidence rate to secure a substantial transmission speed of the 1st classification information more than constant value irrespective of change of a communication link situation. Moreover, said communication

device can be equipped with a means to detect the incidence rate of the transmission error further produced in the received 1st classification information, and a means to change said fixed period according to the detected transmission error incidence rate, and said fixed period progress detection means can also presuppose that it detects that a changed fixed period passed.

[0106] It becomes possible to secure a substantial transmission speed of the 1st classification information more than constant value irrespective of change of a communication link situation by narrowing spacing which transmits the confirmation of receipt with the increment in a transmission error incidence rate by this. Moreover, said communication device can be further equipped with a means to measure the transit delay of said 1st classification information, and a means to change said fixed period according to the measured transit delay, and said fixed period progress detection means can also presuppose that it detects that a changed fixed period passed.

[0107] If it does not wait only for a transit delay by changing said fixed period into time amount shorter than a transit delay when a transmission error occurs in the transmitted confirmation of receipt by this, the nonconformity that the right confirmation of receipt is not obtained is avoided. Thus, since the confirmation of receipt of data performs the communication device concerning this invention, suppressing quality degradation of an image or voice to the minimum, and securing real time nature in the communication system which transmits and receives the data which do not permit an image, voice, and a transmission error in the limited transmission band on real time, especially the practical value is large as multimedia communication equipment.

CLAIMS

[Claim(s)]
[Claim 1] The 1st classification information which needs the confirmation of receipt, and said 1st classification information are communication devices which multiplex multimedia information including the 2nd classification information on a different class, and are transmitted and received per frame. A fixed period progress detection means to detect that a fixed period has passed after transmitting the confirmation of receipt finally, After said detection is made, it has a confirmation-of-receipt transmitting means to transmit the frame containing the confirmation of receipt to the already received 1st classification information. Said confirmation-of-receipt transmitting means The priority storage section which memorizes the priority about the transmission about the confirmation of receipt, the 1st classification information, and the 2nd classification information, The frame decision section which opts for the frame format which consists of at least one of the confirmation of receipt which should transmit according to the priority memorized by said priority storage section, the 1st classification information, and the 2nd classification information, The communication device characterized by including the transmitting section which transmits a frame according to the frame format for which it opted.

[Claim 2] Said fixed period is a communication device according to claim 1 characterized by being a period until the total of the frame in which the 1st classification information was included among the frames received after transmitting the confirmation of receipt

finally reaches constant value.

[Claim 3] Said fixed period is a communication device according to claim 1 characterized by being a period after transmitting the confirmation of receipt finally until fixed time amount passes.

[Claim 4] It is the communication device according to claim 2 or 3 which said communication device is further equipped with a means measure time amount until the first frame containing said confirmation of receipt is transmitted, and a means change the priority memorized by said priority storage section according to the measured time amount after said detection is made, and is characterized by for said frame decision section to opt for said frame format according to the changed priority.

[Claim 5] A means to detect whether advice of the purport which requires resending of said 2nd classification information is included in said multimedia information, and said advice is included in the frame which received said communication device further, It has a means to change the priority remembered to give priority to said 2nd classification information further, and to transmit when said advice was included and it is detected by said priority storage section. Said frame decision section is a communication device according to claim 2 or 3 characterized by opting for said frame format according to the changed priority.

[Claim 6] It is the communication device according to claim 2 or 3 which said communication device is equipped with a means detect the incidence rate of the transmission error further produced in the received 1st classification information, and a means change the priority memorized by said priority storage section according to the detected transmission error incidence rate, and is characterized by for said frame decision section to opt for said frame format according to the changed priority.

[Claim 7] It is the communication device according to claim 2 or 3 which said communication device is equipped with a means to detect the incidence rate of the transmission error further produced in the received 1st classification information, and a means to change said fixed period according to the detected transmission error incidence rate, and is characterized by for said fixed period progress detection means to detect that a changed fixed period passed.

[Claim 8] It is the communication device according to claim 2 or 3 which said communication device is further equipped with a means to measure the transit delay of said 1st classification information, and a means to change said fixed period according to the measured transit delay, and is characterized by said fixed period progress detection means detecting that a changed fixed period passed.